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SB6100 INDUSTRIAL SHOCK-BLOCK™ TECHNICAL FAQ

FAQ

SB6100 Industrial Shock-Block FAQ

What is UL 943C and how does it differ from UL 943?

UL 943 Standard applies to Class A, single- and three-phase, Ground-Fault Circuit-Interrupters (GFCI) intended for protection of personnel, for use only in grounded neutral systems in accordance with the National Electrical Code (NEC), ANSI/NFPA 70, the Canadian Electrical Code, C22.1 (CEC), and Electrical Installations (Use), NOM-001-SEDE. These devices are intended for use on alternating current (AC) circuits of 120 V, 208Y/120 V, 120/240 V, 127 V, or 220Y/127 V, 60 Hz circuits.

UL 943C requirements cover ground-fault circuit-interrupters intended for use in one of the following applications:

1. On grounded-neutral systems where voltage to ground is above 150 Vac and equipment grounding or double insulation is required by the NEC®, ANSI and NFPA 70
2. On grounded-neutral systems where voltage to ground is 150 Vac or less and equipment grounding or double insulation is provided, but the use of a Class A ground-fault circuit interrupter is not practical

Why did UL introduce UL 943C?

UL 943C, Special Purpose Ground-Fault Circuit-Interrupters (SPGFCIs), was introduced to address the two limitations of Class A GFCIs (defined by UL 943) that prohibited their use in many industrial applications. Namely, the system voltage limitation to a maximum of 240 V and a maximum allowed leakage current of 6 mA. UL 943C defines three GFCI Classes: Classes C, D, and E. These new Classes are rated up to 600 V, with a trip level of 20 mA. In addition, UL 943C requires the device to monitor the continuity of the ground wire and interrupt power to the load if ground integrity is lost.

What are the different UL GFCI Classes?

Class A – A GFCI that will interrupt the circuit to the load when the ground-fault current is 6 mA or more but not when the ground-fault current is 4 mA or less and is intended to be used in circuits where the line-to-line voltage is 240 V or less.

Class B – A GFCI that will interrupt the circuit to the load when the ground-fault current exceeds 20 mA. Only used with swimming pool underwater lighting fixtures that were installed prior to local adoption of the 1965 edition of the NEC. Class B GFCI is obsolete.

Class C – A GFCI that will interrupt the circuit to the load when the ground-fault current is 20 mA or more and is intended to be used in circuits with no conductor over 300 V to ground (i.e. systems where line-to-line voltage is 480 V or less) where reliable equipment grounding or double insulation is provided.

Class D – A GFCI that will interrupt the circuit to the load when the ground-fault current is 20 mA or more and is intended to be used in circuits with one or more conductors over 300 V to ground (i.e. 600 V systems), and with specially sized, reliable grounding, to provide a low impedance path so that the voltage across the body during a fault does not exceed 150 V.

Class E – A GFCI that will interrupt the circuit to the load when the ground-fault current is 20 mA or more and is intended to be used in circuits with one or more conductors over 300 volts to ground (i.e. 600 V systems) but with conventional equipment grounding provided for the protected equipment in the system or double insulation. These GFCIs respond rapidly to open the circuit before the magnitude and duration of the current flowing through the person's body exceeds the limits for ventricular fibrillation.

What is the SB6100 Industrial Shock-Block?

SB6100 is available in two models: Special-Purpose Ground-Fault Circuit-Interrupter (SPGFCI) and Equipment Ground-Fault Protection Device (EGFPD). SB6100 – SPGFCI is a UL 943C listed device for personnel protection, while SB6100 – EGFPD is an equipment protection device that is tested to both UL 943 and UL 1053. Both devices implement additional safety features for superior protection.

Is the SB6100 Industrial Shock-Block CSA certified?

Yes, the SB6100 is certified to CAN/CSA C22.2 No. 144-M91.

What does the SB6100 Industrial Shock-Block do?

SB6100 detects leakage current and interrupts the circuit significantly reducing or eliminating the shock potential. One key part of the additional safety features mentioned earlier, is that the SB6100 also monitors the ground wire from the SB6100 to the load for continuity. If the wire is broken or becomes loose, the SB6100 will signal an alarm and interrupt power.

What are the differences between SB6100 – GFCI and SB6100 – EGFPD models?

SB6100 - EGFPD is exactly the same as SB6100 – SPGFCI except that it has variable setpoints (6, 10-100 mA in increments of 10 mA) to provide flexibility and to reduce nuisance tripping in systems with leakage current higher than the fixed 20 mA (SB6100 - SPGFCI setpoint is fixed at 20mA), and the load-ground monitoring is optional (the use of a termination device is not required).

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What are the voltage and current ratings of the SB6100 Industrial Shock-Block?

SB6100 is available for voltages from 208 to 600 V and a maximum full load current of 100 A. The load can be 1-phase (line-to-line) or 3-phase (with no-neutral). The power system can either be solidly-grounded or high-resistance grounded.

What are the benefits of the built-in 3 x Class T 600 V incoming fuses?

The fuses provide overcurrent protection (for a 100 A circuit) and a higher Short-Circuit Current (SCC) rating.

What is the Short-Circuit Current (SCC) rating of the SB6100 Industrial Shock-Block?

SB6100 has a SCC of 50,000 A.

What are the enclosure options available for the SB6100 Industrial Shock-Block?

Two options for enclosures are available: UL-recognized open-chassis models for installation in an existing electrical enclosure (for example, MCCs or switchgears) and UL-listed NEMA-4X enclosed models for stand-alone installations. A mobile version is also available.

What are the applications of the mobile SB6100 Industrial Shock-Block?

The mobile SB6100 is the NEMA 4X enclosed model mounted on a two-wheeled cart to allow for moving the unit while power is off. This cart version can be used when it is required to role the unit in and out (for example, construction, repair and maintenance work). Also it can be used with any portable equipment that is moved around frequently.

What is the importance of using a UL–Listed GFCI?

There are several products on the market that either claim to act like a UL 943C device or have the GFCI designation. With UL 943C and a clear definition of SPGFCIs, this is no longer acceptable. For any product to be used for personnel protection, it must be UL listed. The UL standard also has several additional safety features, such as:

- Monitor ground wire to ensure return path for leakage current
- Performance requirements (trip curves) specific for the application
- A minimum short circuit current rating of 5,000 A (SB6100 was tested up to 50,000 A short circuit)
- Guaranteed to operate at -35C (-31F) to +40C (104F) with a system voltage varying between 85% to 110% of the unit's rated voltage. At the rated system voltage and up to 110%, the SB6100 has a maximum operating temperature of +66C (151F)

How is SB6100 reliability after repeated operation?

To meet UL 943C requirements, SB6100 was tested for thousands of tripping cycles at various operating conditions. Therefore, the reliability of SB6100 after repeated operation is guaranteed, which is another reason for the importance of using a UL-listed Device.

What is a termination device?

For the SPGFCI devices, a termination device is required at the load as well as an additional wire from the SB6100 to the load, called a pilot wire. Since very little current actually flows in the pilot wire, the size should be determined by mechanical means, not current. The EGFPD does not require a termination device at the load.

A termination device is a zener diode installed on the load equipment to monitor the integrity of the ground wire. A ground-check signal is transmitted from SB6100 over a pilot wire, through the termination device, through the load's chassis, and back to the source through the ground wire. If any part of the monitored circuits opens, or the ground-check pilot shorts to ground, the supply will be de-energized.

What is an ELCI?

The term ELCI (Equipment Leakage Circuit Interrupter) is sometimes used to refer to an EGFPD, although ELCI is not a standard UL term.

What are the typical applications for the SB6100 Industrial Shock-Block?

Any application that involves a wet environment including:

- Submersible pumps
- High pressure washers and paint booths
- Water and waste water treatment plants
- Dewatering applications
- Portable equipment (stud guns, heaters, fans, lighting, etc.)
- Temporary wiring (including welding receptacles) used for construction and maintenance
- Tile/concrete cutters
- Power plants
- Food processing plants
- Aquariums, fountains, and swimming pools
- Amusement parks, water slides, golf courses, and arenas

Can the SB6100 Industrial Shock-Block be used in hazardous locations?

Currently, SB6100 is not available in a hazardous location rated enclosure (NEMA 7, 8 and 9). Yet, the open-chassis models can be installed in any hazardous rated switchgear. The operator interface is separately provided with a 10-foot cable so it can be installed in a separate enclosure (for example, a NEMA 4X with a glass door) attached to the hazardous rated enclosure. This allows full control of the unit without the need to get into the hazardous rated switchgear.

Does high-resistance grounding preclude the necessity for GFCI protection?

High-resistance grounding (HRG) can keep an electrical system operating in spite of a ground fault, and they can help reduce the danger from arc flash, but they do nothing for shock hazard. The grounding resistor current is limited to 5 A, which can be fatal if a person touches a live conductor. In other words, HRG offers protection to equipments by limiting the ground fault current but it is not appropriate for personnel protection. Therefore, HRG does not preclude the necessity for GFCI protection.

Can the SB6100 Industrial Shock-Block be used with variable frequency drives?

Currently, SB6100 is not designed to be used with variable frequency drives. Yet, there is a future provision to develop models that can provide personnel protection in variable frequency drive applications.

For more information, visit
www.littelfuse.com/industrialshockblock

Additional technical information and application data for Littelfuse protection relays, fuses and other circuit protection and safety products can be found on **www.littelfuse.com/protectionrelays**. For questions, contact our Technical Support Group **(800-832-3873)**. Specifications, descriptions and illustrative material in this literature are as accurate as known at the time of publication, but are subject to changes without notice. All data was compiled from public information available from manufacturers' manuals and datasheets.

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